Remarks:

Reconsideration of the application is requested.

Claims 1-9 remain in the application. Claims 1-9 are subject to examination. Claim 6 has been amended.

In items 1 and 2 on page 2 of the above-identified Office action, claims 1, 2, 6 and 7 have been rejected as being fully anticipated by U.S. Patent No. 5,983,077 to Dent (hereinafter Dent) under 35 U.S.C. § 102.

The invention of the instant application, as recited in claim 1, relates to amplitude trimming between an analog modulation signal and a digital modulation signal for a PLL circuit based on two-point modulation (see Fig. 1).

Two-point modulation means that a modulation signal is impressed on the PLL circuit at two different points within the PLL circuit. First, the modulation signal is fed - as a digital modulation signal - to the control input of a frequency divider 18 (see Fig. 1). Second, the modulation signal is fed - as an analog modulation signal - to a summation point 15 connected to an input of a VCO 16. The modulation via the digital modulation signal is effective only for modulation frequencies lower than the PLL-bandwidth. Modulation frequencies higher than the PLL-bandwidth are

impressed on the PLL circuit via the analog modulation signal. The analog modulation is not affected by the PLL-bandwidth since the analog modulation signal is directly fed to the VCO input (see Fig. 1). Thus, two-point modulation supports such a modulation, the bandwidth of which being higher than the PLL-bandwidth.

One difficulty with two-point modulation is that a high level of concurrence among the amplitudes of the two modulation signals is required. Otherwise a frequency deviation occurs at the PLL output.

The invention of the instant application guarantees that the analog and the digital modulation swings match.

According to the method of the instant application, the PLL circuit is locked to a desired carrier frequency without impressing any modulation. Afterwards the analog modulation signal (via the summation point 15) and the digital modulation signal (via the frequency divider 18) are fed to the PLL circuit. In case there is a mismatch between the analog and the digital modulation a PLL control error occurs. A signal that is characteristic of the PLL control error is than tapped from the PLL circuit. The analog modulation swing is then changed such that the signal that is characteristic of the PLL

control error has the same value as before the analog and the digital modulation signal were impressed.

After changing the analog modulation swing according to the method of the instant application the analog and the digital modulation are matched. Thus, no frequency deviation resulting from the mismatch between the analog and the digital modulation occurs.

In Dent a system and a method for the compensation of the VCO sensitivity variation with respect to the analog modulation (open loop modulation) is disclosed, with the system and the method being related to a PLL circuit with two-point modulation. Normally, the sensitivity of the VCO, i.e. the differential ratio between the frequency and the VCO control voltage, is not constant and is a function of frequency, i.e. a function of the selected channel. The modulation at a PLL output B resulting from the analog modulation path (via a D/A converter 105) is directly dependent on the sensitivity of a VCO 100 and on the amplitude of the direct modulation at the output of the D/A converter 105 (see Fig. 2 of Dent). Thus, a variation of the VCO sensitivity directly results in a variation of the modulation at the PLL output B and further results in a frequency deviation. To prevent such variation, Dent teaches to measure the frequency versus voltage curve of the VCO 100 (see column

5, lines 43 to 47). For this measurement, a channel is selected via its code signal N and after settling of the PLL the corresponding VCO control voltage V is measured and read to an A/D converter 106 (see column 6, lines 7 to 17). This process is repeated for a plurality of channels. Based on this measurement data, a control processor 200 is able to estimate the VCO sensitivity in dependency of the selected channel (see column 6, lines 45 to 51). Further, the control processor 200 determines channel-related scaling factors in dependency of the channel-specific VCO sensitivity. These scaling factors are used to scale the amplitude of the analog modulation in the DSP 104. Thus, the scaling provides a constant modulation, which is independent of the selected channel.

The method of the instant application and Dent substantially differ in a couple of aspects which are now described.

First, one evident difference between the inventive method and Dent is that according to the method of the instant application analog (and also digital) modulation is impressed on the PLL. In contrast, Dent does not demand to impress analog modulation on the PLL during the VCO sensitivity measurement; in Dent solely the channel code signal N is fed to the PLL (which might be regarded as a kind of digital modulation). Thus, the method of the instant application

takes into account the effect of the complete analog modulation path during the measurement, i.e. from the input of the D/A converter 22 to the output of the VCO 16, whereas in Dent solely the characteristics of the VCO 100 are considered, i.e. the influence of the D/A converter 105 regarding the analog modulation remains unconsidered. Claim 1 of the instant application clearly recites "impressing the analog signal into the PLL circuit ..." in its third paragraph.

Second, the method of the instant application provides for amplitude trimming to be performed at one specific channel selection ("a desired carrier frequency" as recited in paragraph 2 of claim 1). In contrast, Dent teaches to perform a plurality of measurements with different channel selections to estimate the VCO transfer characteristics. Since the VCO sensitivity is a differential variable, at least two measurements with different channel selections have to be performed.

Third, the method of the instant application "directly" removes the amplitude mismatch by measuring, comparing and aligning the control error signal without and with modulation. Further calculations are not necessary. Contrary to the method of the instant application, in Dent the measurement data (i.e. the measured VCO control voltage) has to be processed first via the control processor 200. Dent teaches

to calculate the VCO sensitivity based on the measured VCO control voltage and to estimate the scaling factors based on the calculated VCO sensitivity.

Fourth, the invention of the instant application is based on the idea that a signal being characteristic of PLL control error is determined (with and without modulation). In contrast thereto, Dent teaches to measure the VCO control voltage (in dependency of the selected channel), which has to be regarded in the context of Dent as simply a DC-voltage being applied to the VCO input to generate a specific output frequency. Since the PLL is locked during the measurement of the VCO control voltage, the PLL control error is constantly zero, which does not give any information for amplitude trimming.

Since the characteristic features of the inventive method emphasized above are not believed to be taught in Dent nor rendered obvious to a person of average skill in the art with the knowledge of Dent, claim 1 of the instant application is believed to be novel and not anticipated by Dent.

In regards to amended claim 6 of the instant application, the PLL circuit for two-point modulation contains a device for tapping a signal being characteristic of a PLL control error. Further, the circuit contains a device for obtaining an

evaluation result by evaluating the signal being characteristic of a PLL control error. The device for obtaining an evaluation result itself contains a comparator for comparing the signals being characteristic of the PLL control error arising before and by the time the analog modulation signal and the digital modulation signal are impressed. Finally, the trimming device includes a device for changing a modulation swing in the analog modulation signal based on the evaluation result.

One evident difference between the PLL circuit of claim 6 and Dent is that the PLL circuit of claim 6 contains a comparator for comparing the signals being characteristic of the PLL control error arising before and by the after the analog modulation signal and the digital modulation signal are impressed. In contrast thereto, Dent is not believed to teach to provide such a comparator for receiving such signals.

Since such a comparator for comparing the signals being characteristic of the PLL control error is not taught in Dent nor rendered obvious to a person of average skill in the art with the knowledge of Dent, amended claim 6 is not believed to be anticipated by Dent.

Furthermore, it should be noted that the differences between the teaching of claim 1 of the instant application and the

teaching of Dent, which are emphasized above (see the first-fourth items), are analogously valid regarding the comparison between the teaching of claim 6 and the teaching of Dent.

Support for the changes to claim 6 can be found in Figs. 2 and 3, and from page 16, lines 20 to page 17, line 8.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 or 6. Claims 1 and 6 are, therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claim 1 or 6.

In view of the foregoing, reconsideration and allowance of claims 1-9 are solicited.

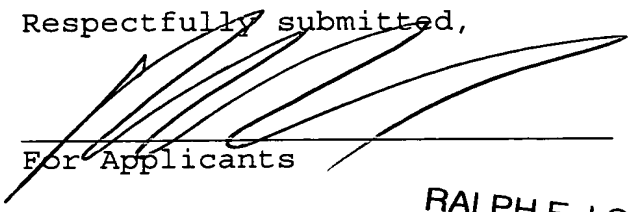
If an extension of time for this paper is required, petition for extension is herewith made.

The extension fee for response within a period of one month pursuant to Section 1.136(a) in the amount of $120.00 in accordance with Section 1.17 is enclosed herewith.

Please charge any other fees that might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and

Greenberg, P.A., No. 12-1099.

Respectfully submitted,



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REL:kf

February 7, 2005

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